lished, thanks to the courtesy of volunteer observers. The department has, however, lost no time in obtaining properly verified instruments, but the difficulties may be gathered from the fact that out of two consignments of grass minimum thermometers only one instrument survived the transport. The heights of the stations are not yet accurately known; many of them have an altitude of 5000 feet to 6000 feet.

THE thirteenth yearly report of the Sonnblick Society for the year 1904 contains an interesting account of some of the results obtained at the highest mountain meteorological stations of Europe, with photographic illustrations; the arduous work done in the interest of meteorological and physical science at some of these inhospitable localities has from time to time been referred to in our columns. In the present report A. Edler von Obermayr discusses the frequency of sunshine at the summit of the Sonnblick (3106 metres) with that at other mountain stations. The tables exhibit some peculiarities:—on Ben Nevis the greatest frequency occurs in June, on the Obir and Säntis in July and August, but on the Sonnblick the greatest frequency occurs exclusively in the winter months, from November to February. A useful index is given in a separate paper of the various items and unusual occurrences contained in the Sonnblick reports for the twelve years 1892–1903.

IN his earliest researches on the properties of gaseous fluorine, M. Henri Moissan showed that it reacted vigorously with nitric acid, fluorine and the vapour of the acid producing a violent explosion. In the current number of the *Comptes rendus* MM. Moissan and Lebeau give an account of a systematic research on the reactions between fluorine and the compounds of nitrogen and oxygen. Nitrogen peroxide and nitrous oxide proved to be perfectly indifferent towards fluorine, but a lively reaction, accompanied by flame, was found to take place between fluorine and nitric oxide. With the nitric oxide in excess, the gaseous products proved to be nitrogen, nitric oxide, and nitrogen peroxide, the fluorine appearing in the form of a solid product of indefinite composition containing platinum (from the tube by which the gas was led in) and nitrous compounds. But with the fluorine in excess, the reaction appeared to be more definite, and a gaseous compound containing fluorine, nitrogen, and oxygen was produced, the substance being solid at the temperature of boiling oxygen. This solid, when allowed to boil off, could be condensed to a colourless liquid at −80° C., and further work is being carried out with the view of establishing its composition and properties.

A SHORT report has been received upon the present state of the work done in connection with the "Technolexicon" of the Society of German Engineers. In the compilation of this universal technical dictionary for translation purposes (in German, French, and English), which was commenced in 1901, about 2000 firms and individual collaborators are assisting at present. Up to now 2,700,000 word-cards have been collected; and this number does not include hundreds of thousands of cards that will result from the working out of the original contributions not yet taken in hand. The editor-in-chief of the "Technolexicon" is Dr. Hubert Jansen, Berlin (NW. 7), Dorotheenstrasse 49, and he will be glad to give any information concerning the work.

A KEY to the first part of "A New Trigonometry for Schools," by Mr. W. G. Borchardt and the Rev. A. D. Perrott, has been published by Messrs. Geo. Bell and Sons.

OUR ASTRONOMICAL COLUMN.

STARS WITH PECULIAR SPECTRA.—Mrs. Fleming has discovered several more new variable stars and other objects having peculiar spectra whilst examining the Henry Draper memorial plates. The designation, position for 1900, magnitude and spectral peculiarities are given for each of these in No. 98 of the Harvard College Observatory Circulars. Several of the objects mentioned have bright lines in their spectra, and one or two call for special remark. For example, a star in Cepheus at R.A. = oh. 7·6m., dec. = +71° 32′, was found to have a spectrum containing five bright bands at λλ 3869, 4101, 4340, 4688, and 4861. The first of these coincides with the bright band seen in certain gaseous nebulæ, the second, third, and fifth will be recognised as due to hydrogen, whilst the fourth, the brightest of all, corresponds to the characteristic line seen in fifth-type stars. The chief nebula line at λ 5000 was not seen. Prof. Pickering suggests that this object may have arrived at an intermediate stage between a nebula and a fifth-type star.

Another star situated in the position R.A. = 1h. 50·2m., dec. = +62° 49′, in the constellation Cassiopeia, is now classed as a gaseous nebula, its spectrum consisting of the chief nebula line at λ 5000.

A second table in the same Circular describes the spectra of twenty-one known variables, and Prof. Pickering states that in most cases of long-period variables the bright hydrogen lines are not seen during the epochs of minima.

VARIABLE STARS IN THE CLUSTERS MESSIER 3 AND 5.—The hundredth Harvard College Circular contains a discussion by Prof. Bailey of the variable stars discovered in the clusters Messier 3 and Messier 5. These two clusters contain a greater proportion of variable stars than any other hitherto examined. Of every seven stars in the former one is a variable, whilst in Messier 5 the ratio is 1 : 11. Periods have been determined for most of the variable stars, and their similarity is remarkable. Only two stars, Nos. 42 and 50 in Messier 5, having periods of 25·74d. and 105·6d. respectively, appear to depart from the rule, all the other variables in both clusters having periods differing but little from 13h. The average deviation from the mean (13h.) in Messier 3 is 1h. 0m., and in Messier 5 (mean 12h. 45m.) 1h. 13m. All the variables are of nearly the same magnitude, varying from 13·0m. to 16·0m., and there is a slight suggestion that the periods of them undergo a secular variation in length.

SPECTROHELIOGRAPH RESULTS.—In No. 4, vol. xxi., of the *Astrophysical Journal*, Mr. Phillip Fox, of the Yerkes Observatory, discusses the observations made with the Rumford spectroheliograph during 1904. The plates secured with the H_2 radiation, *i.e.* the radiation of the centre of the H calcium line, show a decided increase of activity in the flocculi over that observed during 1903, and are being measured in order to determine the solar rotation period at the height, above the photosphere, of the high-level flocculi.

Many series of plates, on which the individual exposures were made at intervals of a few minutes, the successive settings of the secondary slit being made in ten or twelve steps from λ 3952·4 to λ 3968·6, were secured, and Mr. Fox briefly discusses these in regard to the distinction between faculæ and flocculi in the calcium vapour images. Such a series of photographs, taken on August 25, is reproduced on one of the plates accompanying the paper, and shows that few, if any, flocculi appear in the high levels without their bases appearing, although usually diminished, in the lower levels. Even the bright patches designated "eruptions" by Messrs. Hale and Ellerman can be traced as such as far down as the photograph taken with the secondary slit set at λ 3967. The photographs secured with the hydrogen radiations Hβ, Hγ, and Hε generally show flocculi coincident with those seen on the calcium photographs, and in nearly all cases where the eruptions could be traced to the limb associated prominences were discovered above the flocculus.

No prominences of great height or unusual form were photographed on the limb during 1904, but some of the plates show a fair number, and one or two beautiful examples are reproduced on the second plate of the paper.

VISIBILITY OF D_3 AS A DARK LINE IN THE SOLAR SPECTRUM.—At a recent meeting of the Royal Astronomical Society, Prof. A. Fowler stated, in a paper on the spectrum of the great sun-spot of February last, that he had, on February 2, observed the helium line D_3 as a dark and distorted line in the spectrum of the sun in the region about the spot disturbance. This observation was regarded as unusual, but according to a letter written by Mr. A. Buss to the *Observatory* (No. 358) it is not at all an uncommon phenomenon, and can be seen frequently if the solar spectrum be closely watched. In fact, Mr. Buss states that, according to his observations with a curved slit spectroscope, D_3 may be seen as a dark line in every really agitated solar disturbance.

WEST HENDON HOUSE OBSERVATORY.—No. 3 of the Publications of the West Hendon House Observatory (Sunderland) is devoted to the observations of variable stars made by Mr. Backhouse during the years 1866–1904. The observations of each of the forty-nine stars discussed are set out in detail in tables showing the times of observation, the comparison stars, and the magnitudes according to other catalogues. For a number of stars the observed magnitudes are plotted on a series of curves placed at the end of the volume, with a diagram showing the various gradations of colour employed in the descriptions.

NATURE AND MAN.

THE annual Romanes lecture was delivered by Prof. E. Ray Lankester, F.R.S., in the Sheldonian Theatre, Oxford, on June 14, on the subject of "Nature and Man." The complete lecture has been published by the Clarendon Press (London: Henry Frowde), and the following abstract indicates a few of the points considered in it.

Prof. Lankester remarked that the subject of his discourse is one which has largely occupied the attention of biologists during the five-and-forty years in which he has followed the results of scientific discovery. Much misconception prevails as to the signification attached to the word "Nature," but the lecturer used it as indicating the entire cosmos of which this cooling globe with all upon it is a portion. Until the eighteenth century the study of nature—nature-knowledge and nature-control—was the appropriate occupation of the learned men at Oxford, and the present peculiar classical education is a modern innovation.

During the latter half of the nineteenth century, the observations of nature-searchers made it possible to establish the general doctrine of the evolution of the cosmos, with more special detail in regard to the history of the earth and the development of man from a lower animal ancestry. The general process by which the higher and more elaborate forms of life, and eventually man himself, have been produced was shown by Darwin to depend upon heredity and variation. By the process of natural selection, those organisms survive which are most fitted to the special conditions under which they live. Man eventually emerged from the terrestrial animal population strictly controlled and moulded by natural selection. The leading feature in the development and separation of man from other animals is the relatively large size of his brain, which has five or six times the bulk (in proportion to his size and weight) of that of any other surviving Simian. The development of the mental qualities has given rise to attributes which are peculiar to man, and justify the view that man forms a new departure in the gradual unfolding of nature's predestined scheme.

"Civilised man has proceeded so far in his interference with extra-human nature, has produced for himself and the living organisms associated with him such a special state of things by his rebellion against natural selection and his defiance of nature's pre-human dispositions, that he must either go on and acquire firmer control of the conditions or perish miserably by the vengeance certain to fall on the half-hearted meddler in great affairs." It is practically certain that all epidemic disease could be abolished within a period so short as fifty years if the State cared to take the matter in hand and employ the means at the command of science. If more men were encouraged to study and experiment on this matter, there would soon be an end of all infectious disease.

By the exercise of his will, man has done much to control the order of nature, and it is urgent for him to apply his whole strength and capacity in gaining further control. Little, however, is being done in this direction, but when a knowledge of the situation reaches the masses of the people, "the democracy will demand that those who expend the resources of the community, and as Government officials undertake the organisation of the defence and other great public services for the common good, shall put into practice the power of nature-control which has been gained by mankind, and shall exert every sinew to obtain more. To effect this, the democracy will demand that those who carry on public affairs shall not be persons solely acquainted with the elegant fancies and stories of past ages, but shall be trained in the acquisition of natural knowledge and keenly active in the skilful application of nature-control to the development of the well-being of the community."

The concluding subject of the lecture was the influence exerted by the University of Oxford upon the welfare of the State and of the human community in general. Oxford by its present action in regard to the choice of subjects of study "is exercising an injurious influence upon the education of the country, and especially upon the education of those who will hereafter occupy positions of influence, and will largely determine both the action of the State and the education and opinions of those who will in turn succeed them." Is it desirable to continue to make the study of two dead languages the main, if not the exclusive, matter to which the minds of the youth of the well-to-do class are directed by our schools and universities? In view of modern needs it would be more sensible to make the chief subject of education for everybody "a knowledge of nature as set forth in the sciences, which are spoken of as physics, chemistry, geology, and biology." The ablest youths of the country should be encouraged to proceed to the extreme limit of present knowledge of one of these branches of science so that they might become makers of new knowledge, and the possible discoverers of enduring improvements in our control of nature. The great prizes of life ought to be given to the young man who pursues nature-knowledge successfully rather than to him who takes up less important subjects. In other words, it is desirable that our scheme of education should centre round a knowledge of nature and not continue to be mainly classical and historical.

Though men of science would make natural knowledge the core of education, they would consider it incomplete if a serviceable knowledge of foreign languages, and a real acquaintance with the beauties of English and other literature, were not added. "The studies of the past carried on at Oxford have been charming and full of beauty, whilst England has lain, and lies, in mortal peril for lack of knowledge of nature."

The suggestion "that Oxford should resign herself to the overwhelming predominance given to the study of ancient elegance and historic wisdom within her walls" is an insult to her and an impossibility. Only a few decades have passed since Oxford sent out Robert Boyle and Christopher Wren. Moreover, Oxford exerts an immense influence on the schools, and for this reason men of science cannot be content with the maintenance by the university of the compulsory study of Greek and Latin, and the neglect to make the study of nature an integral and predominant part of every man's education. For "the knowledge and control of nature is man's destiny and his greatest need."

SCIENCE AND THE STATE.

THE seventh of the series of weekly pamphlets which are appearing under the editorship of Mr. W. T. Stead, with the general title of "Coming Men on Coming Questions," is by Mr. R. B. Haldane, and is entitled "The Executive Brain of the British Empire." Mr. Haldane is an enthusiast for higher education. He is a thorough believer in the policy which has been advocated